2001-182872

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(54) HOSE FOR REFRIGERANT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a transport hose for completely preventing transmission of carbon dioxide as a refrigerant while holding flexibility, in relation to the transport hose using carbon dioxide as the refrigerant.

SOLUTION: This hose for refrigerant is composed of an inner surface metallic layer which consists of a bellows pipe, an elastic layer which consists of rubber or thermoplastic resin for covering its outside, and a reinforcing layer which is formed by winding or spirally winding metallic wire or organic fiber for covering the outside of the elastic layer. 1.. (spiral) metallic pipe, 2.. elastic layer, 3.. reinforcing layer, 4.. outer surface layer.

[Claim(s)]

[Claim 1] The hose for refrigerants characterized by becoming an inner surface metal layer from a wrap reinforcement layer about the outside of a wrap elastic layer and the elastic layer concerned in the outside.

[Claim 2] The hose for refrigerants according to claim 1 whose inner surface metal layer is an accordion tube.

[Claim 3] The hose for refrigerants according to claim 1 which has the thickness by which an elastic layer buries the depression section of an accordion tube.

[Claim 4] The hose for refrigerants according to claim 1 to 3 whose elastic layer is rubber or thermoplastics.

[Claim 5] A reinforcement layer is a braid or the hose for refrigerants according to claim 1 which carries out a spiral volume about a metal wire or organic fiber.

[Claim 6] The hose for refrigerants according to claim 1 to 5 which equipped the outside of a reinforcement layer with the external layer.

DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention starts the hose for transport which prevented transparency of the carbon dioxide as a refrigerant thoroughly about the hose for transport which uses a carbon dioxide as a refrigerant, maintaining flexibility.

[0002]

[Description of the Prior Art] As a refrigerant of the air-conditioner system of an automobile, although chlorofluorocarbon (CFC-12) was used conventionally, the activity was forbidden for maintenance of earth environment. And (HFC-134a) is widely used as a chlorofluorocarbon-replacing material. However, this chlorofluorocarbon-replacing material is also seen in earth environment, and although ozone modulus of rupture is zero, the warming multiplier of the earth is causing warming acceleration highly.

[0003] For this reason, changeover to the small refrigerant of a global warming potential is studied, and that development that uses a carbon dioxide as a refrigerant as one is furthered. However, by the air-conditioner system using a carbon dioxide, a service condition becomes severe and differing from the air-conditioner system which used HFC-134a greatly is especially pointed out with the hose by the side of DISUCHAJI. For example, by the air-conditioner system which used HFC-134a for the proof-pressure target, the system which was with the carbon dioxide to being 3-4Mpa takes 150-170 degrees C to the latter to the former being 120 degrees C in heatproof 15 to 20 Mpa. Furthermore, the gas transmission coefficient under these conditions of a carbon dioxide is about 200 times the transmission coefficient of HFC-134a, and this cure is also required for it.

[0004] In case the polymeric materials which constitute the hose for refrigerants from under such conditions are chosen, even if it used thermoplastics, such as an alloy of nylon or nylon, and an olefin, for the tapetum, the amount of transparency of a carbon dioxide will be about 20 times the amount of transparency in the system using current HFC-134a, and an activity on actual cannot be presented with it as an air-conditioner system. Furthermore, when saying, since service temperature was also very higher than HFC-134a, it was very difficult [ it ] to constitute a hose only from rubber or thermoplastics.

[0005] Thus, since the hose by polymeric materials cannot present practical use, the hose which carried out braid reinforcement of the metal wire is partly proposed by this using the metal accordion tube. Since this hose is a metallic conduit, transparency of a carbon dioxide has many points which must be improved in respect of [ of what can be prevented thoroughly ] others. That is, it also becomes a cost rise, while it is necessary to thicken thickness of bellows beforehand according to it and weight will become heavy, if it remains in an activity in the range which the bellows of a metal accordion tube does not deform with internal pressure and internal pressure becomes high.

[0006] Of course, it cannot be denied that flexibility will become scarce so much if the thickness of an accordion tube becomes thick, flexibility is as low as the thing for high voltage, and construction workability worsens. Furthermore, it was repeatedly weak to crookedness, and the crack kept such an accordion tube for a short time as close comparatively, and it was low as practical use value.

[0007]

[Problem(s) to be Solved by the Invention] As for this invention, structure also offers a comparatively easy hose about the optimal hose, using a carbon dioxide as a refrigerant.

[0008]

[Means for Solving the Problem] the thickness by which it is characterized by the hose for refrigerants of this invention serving as [ outside / the ] an inner surface metal layer from a wrap reinforcement layer in the outside of a wrap elastic layer and the elastic layer concerned, and an inner surface metal layer is an accordion tube, and an elastic layer buries the depression section of an accordion tube preferably -- having -- a reinforcement layer -- a metal wire or organic fiber -- a braid -- or a spiral volume is carried out.

[0009]

[Embodiment of the Invention] If the desirable gestalt of the hose of this invention is explained

hereafter, while preventing transparency of a carbon dioxide thoroughly by equipping an innermost layer with a metal layer (accordion tube), flexibility is given, an elastic layer is further formed on this metal layer, the internal pressure applied to a metal layer by this is distributed, and this layer is made to bear internal pressure to homogeneity by considering as an accordion tube. Furthermore, flexibility is held again by carrying out ******(ing) or SUPARARU volume attachment of a metal wire or the organic fiber as a reinforcement layer.

[0010] Stainless steel, copper, and an aluminum alloy are mentioned as an ingredient which forms a metal layer. In addition, brass plating may be beforehand performed to a front face for adhesion of a metal layer with a wrap elastic layer. In addition, even if the bellows configuration of the accordion tube which is a gestalt with a desirable metal layer is spiral, it may be the bellows with which each became independent.

[0011] considering a metal layer as an example of a wrap elastic layer, rubber or thermoplastics, such as ethylene propylene rubber (EPDM), nitril butadiene rubber (NBR), chloroprene rubber (CR), isobutylene isoprene rubber (IIR), acrylic rubber (ACM), and ethylene-acrylic rubber (AEM), is independent -- or it is mixed and used. In addition, it cannot be overemphasized that a wrap elastic layer does not need to bury the depression section of an accordion tube for a metal layer thoroughly.

[0012] Moreover, when using thermoplastics as an elastic layer, it is effective to heat a metal accordion tube, in order to make it filled up with resin to the depression section of an accordion tube still more easily, or to heat a metal for resin by the high-frequency induction heating after a coat etc.

[0013] As an example of a wrap reinforcement layer, steel wire, a stainless steel wire, a polyethylene terephthalate fiber (PET), polyethylenenaphthalate fiber (PEN), nylon fiber, an aramid fiber, carbon fiber, etc. can be used, and let the elastic layer of each other be the spiral layer rolled in the braid, or a pair and the direction to make.

[0014] in addition -- although this reinforcement layer may be surrounded, an external layer can also be formed and the ingredient same in ingredient as the above-mentioned elastic layer is sufficient -- the object -- responding -- the suitably optimal ****** -- it becomes things. An external layer can also be removed by making a reinforcement layer into a stainless steel wire.

[0015]

[Example] (Example of manufacture) This invention is further explained to a detail with an example. First, after degreasing this outside surface enough using the pitch 2mm spiral accordion tube of 0.2mm bore of 7.5mm in thickness made from stainless steel, the outer diameter of 11.5mm, and bellows, two coats was given, using KEMUROKKU 205 and KEMUROKKU 234B (all being load company make) as vulcanization adhesives.

[0016] The mandrel equivalent to the bore of the accordion tube made from the iron used as a mandril etc. was inserted inside the accordion tube here. And EPDM rubber was covered as an elastic layer using the extruder which has a crosshead on the periphery of an accordion tube. At this time, it extruded so that EPDM rubber might fill up the depression section of bellows thoroughly, and conditions were adjusted. In addition, although the mandrel was inserted in the

accordion tube and covered with this example with the elastic layer, also not using a mandrel, the coat of an elastic layer is possible.

[0017] Subsequently, on EPDM (un-vulcanizing) rubber, four hard drawn steel wires of the 0.33mm size which carried out brass plating were doubled, and it knit up out of pitch 30mm with the braider of 24 carriers, and considered as the reinforcement layer. Furthermore, the sheet of EPDM with a thickness of 0.8mm was twisted around the outer layer of this reinforcement layer as an external layer for reinforcement layer protection, and the wrapping sheet was twisted further outside.

[0018] After performing vulcanization of this hose at 150 degrees C for 60 minutes and removing a wrapping sheet, the mandrel in an accordion tube was sampled and the hose for refrigerants was obtained. drawing 1 and drawing 2 -- some of these hose for refrigerants -- it is a notching side elevation. Among drawing, as for a spiral metallic conduit and 2, an elastic layer and 3 are reinforcement layers, a sign 1 is a hose for refrigerants (example 1) with which drawing 1 does not cover an external layer 4, and drawing 2 is the hose (example 2) which gave this external layer.

[0019] (Example of a trial) This hose was made into die length of 500mm, and the splicing fitting used for a known metal accordion tube was compared with the known metal accordion tube hose (example 1 of a comparison) about installation, flexibility, pressure resistance, repeat bendability ability, and the repeat application-of-pressure engine performance. The configuration of this hose is as being shown in drawing 3 , and it is designed so that it can be equal to the activity of 20MPa. A test result is shown in drawing 3 .

[0020] Flexibility: It considered as the force at the time of bending to one 5 times the radius of an outer diameter.

Pressure resistance: Apply internal pressure with water pressure and it is a pressure at the time of being destroyed.

Repeat bendability ability: The count of a repeat until it repeats installation for a hose, it repeats 150mm and the longest point for the shortest point to U typeface as 250mm and internal pressure leaks from bending and a hose to it was investigated.

Repeat application-of-pressure engine performance: It pressurized repeatedly by 30cpm in the 150-degree C ambient atmosphere, having used 15MPa-0MPa as 1 cycle for internal pressure with bend radii of 75mm by having used the 500mm hose as installation at U typeface.

[0021]

[Effect of the Invention] Compared with the conventional metal accordion tube hose, flexibility and pressure resistance of the hose [ for refrigerants ] in this invention improve, repeat bendability ability and the repeat application-of-pressure engine performance improve by leaps and bounds compared with the conventional hose further, and the practicability is very high.